

# Assignment 3

## Number Systems

Textbook Assignment: Chapter 5

### *Learning Objective:*

*Identify structure and characteristics of number systems having various bases.*

● In items 3-1 through 3-58, numbers without a subscript indicating a particular base are written in the decimal system (base ten) unless otherwise indicated.

3-1. What is the radix in a senary system?

1. 6
2. 7
3. 9
4. 16

3-2. The expression  $3(10)^3 + 0(10)^2 + 1(10)^1 + 1(10)^0$  is a representation by positional values of

1. 3010
2. 3011
3. 27010
4. 30010

3-3. The polynomial form of 543 is

1.  $500 + 43$
2.  $5 + 4 + 3$
3.  $(5 \times 3) + (4 \times 2) + (3 \times 1)$
4.  $5(10)^2 + 4(10)^1 + 3(10)^0$

3-4. What is the largest probable system formed by using only the digits 0, 1, and 2? (The greatest digit in the number system with base n is n-1)

1. Binary
2. Ternary
3. Quaternary
4. Quinary

$6^5$	$6^4$	$6^3$	$6^2$	$6^1$	$6^0$
0	0	5	4	2	3

Figure 3A.--Number System

● When answering items 3-5 and 3-6 refer to figure 3A and consider characteristics of the number system represented.

3-5. What is the radix of the number system?

1. 6
2. 4
3. 3
4. 2

3-6. What is the value of the digit 4?

1. 4
2.  $(4^6)^2$
3.  $4 \times 6^2$
4.  $6 \times 4^2$

3-7. The expression,  $a(7)^2 + a(7)^1 + a(7)^0$ , is a representation by place values of

1.  $210_a$
2.  $210_7$
3.  $777_a$
4.  $aaa_7$

3-8. Which of the following is a characteristic of a vicenary system (base 20)?

1. The radix is two.
2. The number 20 is a digit of the system.
3. The number 12 is not a digit of the system.
4. Ten more symbols are needed than are used in the decimal system.

3-9. The number  $B3BD_{16}$  means

1.  $B(16)^3 + B(16)^2 + 3(16)^1 + D(16)^0$
2.  $B(16)^3 + 3(16)^2 + B(16)^1 + D(16)^0$
3.  $B(16)^4 + 3(16)^3 + B(16)^2 + D(16)^1$
4.  $B(16)^3 + B(16)^2 + D(16)^1 + 3(16)^0$

### *Learning Objective:*

*Perform addition and subtraction in various number systems.*

When answering items 3-10 through 3-20, perform the indicated operation.

3-10.  $411_5 + 434_5 =$

1.  $800_5$
2.  $845_5$
3.  $1400_5$
4.  $2310_5$

3-11.  $310_5 + 422_5 + 121_5 + 242_5 =$

1.  $1095_5$
2.  $1200_5$
3.  $2150_5$
4.  $2200_5$

3-12.  $1110_2 + 1011_2 =$

1.  $1111_2$
2.  $10001_2$
3.  $11001_2$
4.  $11111_2$

3-13.  $741_8 + 642_8 =$

1.  $1383_8$
2.  $1403_8$
3.  $1583_8$
4.  $1603_8$

3-14.  $386t_{12} + et4t_{12} =$

1.  $116e8_{12}$
2.  $136e8_{12}$
3.  $11710_{12}$
4.  $13610_{12}$

3-15. In base 16; if A = 10, B = 11, C = 12, D = 13, E = 14 and F = 15, then  $CDF_{16} + BCA_{16} =$

1.  $17A9_{16}$
2.  $1809_{16}$
3.  $18A9_{16}$
4.  $2355_{16}$

3-16.  $2321_5 - 413_5 =$

1.  $1403_5$
2.  $1408_5$
3.  $1903_5$
4.  $1908_5$

3-17.  $11010_2 - 101_2 =$

1.  $10101_2$
2.  $10111_2$
3.  $11001_2$
4.  $11111_2$

3-18.  $7521_8 - 3546_8 =$

1.  $3785_8$
2.  $37838$
3.  $3775_8$
4.  $3753_8$

3-19.  $t91e_{12} - 8e21_{12} =$

1.  $189t_{12}$
2.  $18et_{12}$
3.  $199t_{12}$
4.  $19et_{12}$

3-20.  $CAFE_{16} - BEAD_{16} =$

1.  $0C41_{16}$
2.  $0C51_{16}$
3.  $1241_{16}$
4.  $1251_{16}$

*Learning Objective:*

*Recognize characteristics of complements and use complements in solving problems.*

3-21. If a = the number, b = the complement, and c = the reference power, which equation describes subtraction by complements?

1.  $a + b = c$
2.  $a - b = c$
3.  $a + c = b$
4.  $b + c = a$

3-22. Which statement is true concerning subtraction by complements?

1. The true remainder of the apparent remainder 0562 is -562.
2. The true remainder of the apparent remainder 0743 is -257.
3. The true remainder of the apparent remainder 1432 is -432.
4. The true remainder of the apparent remainder 1652 is +348.

3-23. In the binary system, what is the twos complement of zero?

1. 0
2.  $1_2$
3.  $10_2$
4.  $11_2$

3-24. What is the twos complement of  $10101_2$ ?

1.  $01010_2$
2.  $01011_2$
3.  $01100_2$
4.  $11011_2$

3-25. Subtract  $1010_2$  from  $1000_2$  using complements

1.  $-0010_2$
2.  $-0011_2$
3.  $-0110_2$
4.  $-0111_2$

*Learning Objective:*

*Perform multiplication and division in various number systems.*

When answering items 3-26 through 3-35, perform the indicated operation.

3-26.  $324_5 \times 242_5 =$

1.  $201113_5$
2.  $233243_5$
3.  $236443_5$
4.  $238223_5$

3-27.  $1110_2 \times 101_2 =$

1.  $100110_2$
2.  $1000110_2$
3.  $1001110_2$
4.  $1010110_2$

3-28.  $542_8 \times 42_8 =$

1.  $22764_8$
2.  $25344_8$
3.  $27404_8$
4.  $29424_8$

3-29.  $e6_{12} \times te_{12} =$

1.  $t456_{12}$
2.  $t566_{12}$
3.  $e366_{12}$
4.  $e456_{12}$

3-30.  $BAD_{16} \times AD_{16} =$

1.  $79369_{16}$
2.  $7C8D9_{16}$
3.  $7E3E9_{16}$
4.  $7E429_{16}$

3-31.  $4213_5 + 3_5 =$

1.  $1112_5$
2.  $1211_5$
3.  $1221_5$
4.  $1222_5$

3-32.  $2046_8 + 11_8 =$

1.  $162_8$
2.  $166_8$
3.  $186_8$
4.  $189_8$

3-33.  $1000010_2 + 110_2 =$

1.  $1111_2$
2.  $1110_2$
3.  $1010_2$
4.  $1011_2$

3-34.  $7tee7_{12} + 5_{12} =$

1.  $16452_{12}$
2.  $16t34_{12}$
3.  $16e74_{12}$
4.  $16eee_{12}$

3-35.  $BEE_{16} + 6_{16} =$

1.  $1FD_{16}$
2.  $1C8_{16}$
3.  $1A9_{16}$
4.  $192_{16}$

*Learning Objective:*

*Given various number systems, convert to other specified number systems.*

3-36. Convert  $ACE_{16}$  to the decimal system by use of the polynomial form.

1. 24,322
2. 8,944
3. 4,288
4. 2,766

3-37. Convert  $7422_{12}$  to the decimal system by synthetic substitution.

1. 13,194
2. 12,892
3. 12,698
4. 10,488

- 3-38. When converting  $ABC_{16}$  to the decimal system by use of repeated division where the remainders indicate the decimal equivalent, the dividends are divided by
1. A
  2. ABC
  3. 10
  4. 16
- 3-39. Convert  $6456_{12}$  to the decimal system by use of repeated division where the remainders indicate the decimal equivalent. The second quotient equals
1. 72
  2. 84
  3. 88
  4. 92
- 3-40. What is the order of remainders (resulting from repeated division) which represent  $6456_{12}$  in the decimal system?
1. 1011
  2. 11010
  3. 11101
  4. 11110
- Convert the decimal to the given non-decimal in items 3-41 through 3-45.
- 3-41. Convert 415 to base five.
1.  $270_5$
  2.  $2450_5$
  3.  $3130_5$
  4.  $3490_5$
- 3-42. Convert  $1212$  to base eight.
1.  $2247_8$
  2.  $2274_8$
  3.  $2427_8$
  4.  $2472_8$
- 3-43. Convert  $12468$  to base 12.
1.  $7207_{12}$
  2.  $7270_{12}$
  3.  $7702_{12}$
  4.  $7720_{12}$
- 3-44. Convert  $24862$  to base 16.
1.  $611E_{16}$
  2.  $61E1_{16}$
  3.  $6E11_{16}$
  4.  $E116_{16}$
- 3-45. Convert 69 to base 2.
1.  $1000101_2$
  2.  $1000110_2$
  3.  $1001001_2$
  4.  $1001100_2$
- 3-46. Convert  $642_{12}$  to the base eight by going through base ten.
1.  $1226_8$
  2.  $1262_8$
  3.  $1622_8$
  4.  $2621_8$
- 3-47. Convert  $2342_5$  to the base twelve without going through base ten.
1.  $21e_{12}$
  2.  $24e_{12}$
  3.  $2e4_{12}$
  4.  $e42_{12}$
- 3-48. Convert  $234_5$  to base two without going through base ten.
1.  $1000011_2$
  2.  $1000101_2$
  3.  $1000110_2$
  4.  $1001001_2$
- 3-49. Convert  $452_8$  to base twelve by the explosion method.
1.  $3t0_{12}$
  2.  $2t0_{12}$
  3.  $20t_{12}$
  4.  $222_{12}$
- 3-50. Convert  $CA2_{16}$  to base five by the explosion method.
1.  $100441_5$
  2.  $100440_5$
  3.  $100414_5$
  4.  $100404_5$
- 3-51. Separate  $1101101_2$  into groups for converting to base eight.
1. 110      110      100
  2. 110      110      001
  3. 110      001      101
  4. 001      101      10
- 3-52. Convert  $110001111_2$  to base sixteen.
1.  $18F_{16}$
  2.  $189_{16}$
  3.  $149_{16}$
  4.  $114_{16}$

3-53. Convert  $471_8$  to base two.

1.  $100011101_2$
2.  $100110101_2$
3.  $100111001_2$
4.  $100111011_2$

3-54. Convert 84 to the Binary Coded Decimal (BCD).

1. 1100
2. 10000100
3. 10000101
4. 10010100

3-55. Convert the Binary Coded Decimal 011101000010 to a decimal.

1. 343
2. 742
3. 743
4. 752

3-56. A disadvantage of the BCD is that the code does not provide a "decimal" carry.

3-57. Add 18 and 43 in the excess three code.

1. 0100 0100
2. 1000 0010
3. 1001 0100
4. 1100 0010

3-58. Find the nines complement of 3 in the excess three code.

1. 0111
2. 1000
3. 1001
4. 1010